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PATENT APPLICATION

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Patent Application Transmittal Letter

COMMISSIONER FOR PATENTS
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Sir:

Transmitted herewith for filing under 37 CFR 1.53(b) is a(n): **(X)** Utility   ( ) Design

(X) original patent application,

( ) continuation-in-part application

INVENTOR(S): **Daniel R. Pearson, David A. Kumpf and Glenn G. Carcido**

TITLE: **ADAPTIVE SCAN DRIVER AND SCAN PERIPHERAL**

Enclosed are:

(X) The Declaration and Power of Attorney.   ( ) signed   **(X)** unsigned or partially signed

(X) __4__ sheets of drawings (one set)   ( ) Associate Power of Attorney

( ) Form PTO-1449   ( ) Information Disclosure Statement and Form PTO-1449

( ) Priority document(s) ( ) (Other) _____ (fee $_____)

CLAIMS AS FILED BY OTHER THAN A SMALL ENTITY				
(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) TOTALS
TOTAL CLAIMS	13 — 20	0	X $18	$ 0
INDEPENDENT CLAIMS	4 — 3	1	X $80	$ 80
ANY MULTIPLE DEPENDENT CLAIMS	0		$270	$ 0
BASIC FEE: Design ($320.00); Utility ($710.00)				$ 710
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Charge $____790____ to Deposit Account 08-2025. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16, 1.17, 1.19, 1.20 and 1.21. A duplicate copy of this sheet is enclosed.

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By _____

Typed Name: **Alfredo Zhagui**

Respectfully submitted,

Daniel R. Pearson, David A. Kumpf and

By _____

Steven P. Fallon

Attorney/Agent for Applicant(s)
Reg. No.   **35,132**

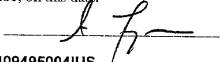Date: **10/5/00**

Telephone No.: **(312) 993-0080**

HP-10006131-1

Daniel R. Pearson, David A. Kumpf and Glenn G. Carcido

1   ADAPTIVE SCAN DRIVER AND SCAN PERIPHERAL

2   FIELD OF THE INVENTION

3   The field of the invention is scan peripherals. The invention is

4 directed toward a driver for controlling scan jobs directed to a scan peripheral. A

5 driver of the invention may be embodied in a dedicated peripheral server.

6   BACKGROUND OF THE INVENTION

7   A scan peripheral is a scanner or multi-function device including a

8 scanning function. Scan peripherals may be accessed through a server so that

9 multiple users may use the same scan peripheral over a network, for example. A

10 single machine may also directly access or share access to a scan peripheral or

11 multiple peripherals through a server. A single machine might also contain a

12 driver to interface to a scan peripheral directly.

13   A scan peripheral server is typically realized in software that is

14 installed in some type of general purpose computer system. Hardware might also

15 be used, but would be more difficult to realize. Server software may be run in the

16 general purpose computer of a specialized physical device, such as a Hewlett-

17 Packard JetDirect® external or internal server. JetDirect® devices can control

18 multiple scan peripherals, including scanners and multi-function peripherals. Each

19 scan peripheral requires a driver, which functions to control a scan job from a

20 particular peripheral according to the capabilities and protocol for the particular

1   peripheral. A JetDirect® server or other server that interfaces to multiple scan

2   peripherals typically includes multiple drivers to facilitate control of scan jobs

3   from different scan peripherals.

4   A problem arises when a scan peripheral server having a set of

5   drivers or a stand-alone driver encounters a scan peripheral unaccounted for by the

6   existing driver(s). This may happen, for example, when scan peripherals are

7   replaced with new scan peripherals or new scan peripherals are added. In such a

8   case, a new scan peripheral will not work with the old server/driver and a user

9   must take additional inconvenient steps to make the new scan peripheral work.

10   Expense and frustration often result.

11   Thus, there is a need for an improved scan peripheral driver. It is an

12   object of the invention to provide such a driver. A further object of the invention

13   is to provide an improved scan peripheral server and improved scan peripheral.

14   SUMMARY OF THE INVENTION

15   A driver of the invention meets such a need by adapting to scan

16   peripherals using information in a capability descriptor provided by a scan

17   peripheral or a capability descriptor associated with a scan peripheral based on the

18   model of the scan peripheral. A driver of the invention automatically determines a

19   scan peripheral's capabilities using information from the capability descriptor, and

20   uses the information to configure itself from a set of driver modules. A user

21   interface and scan job are then run through options enabled by the appropriate set

22   of driver modules as determined by the capability descriptor.

23   A preferred embodiment server of the invention embodies such an

24   adaptive driver that queries a scan peripheral when it is first connected to the

25   server. If an appropriate capability descriptor is obtained in response to the query,

26   the capability descriptor is stored for use during a scan job. When a scan job using

27   that peripheral is requested, user interface code extracts information from the

28   capability descriptor to allow the user interface to dynamically change dependent

1   upon the peripheral's capabilities as indicated by the information from the
2   capability descriptor. Capabilities indicated by a capability descriptor might
3   include, for example, dots per inch choices, paper sizes, color/grayscale options,
4   image formats, and whether or not a preview scan is supported. The appropriate
5   capabilities become selectable through a user interface at a client computer. When
6   a scan job is directed, scan driver software/firmware uses selected parameters
7   passed by the client and the information from the stored capability descriptor to
8   determine an appropriate command protocol and image encoding. A set of driver
9   modules is then dynamically linked to create an appropriate driver for the scan job.

10   The invention also includes a scan peripheral or multi function
11   peripheral capable of supplying a capability descriptor in response to a request.
12   The preferred driver of the invention expects to receive a capability descriptor.
13   However, in an aspect of the invention, the preferred driver or a preferred server
14   including the driver may also address the case of scan peripherals or multi
15   function peripherals that are not capable of providing a capability descriptor in
16   response to a request. In this aspect of the invention, the preferred driver includes
17   stored capability information corresponding to a set of known scan peripherals or
18   multi function peripherals. When the driver fails to receive an appropriate
19   capability descriptor in response to a request, the driver then selects from the
20   stored capability information based upon the model of scan peripheral. Model
21   information is typically provided by conventional scan peripherals on request.

22   BRIEF DESCRIPTION OF THE DRAWINGS

23   FIG. 1 is a block diagram illustrating a preferred server of the
24   invention connected to a network and multiple peripherals;

25   FIGs. 2a and 2b are a flowchart illustrating steps performed by a
26   preferred driver program of the invention and

27   FIG. 3 is a block diagram for a preferred driver program of the
28   invention usable in the server of FIG 1.

3

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

1   The invention, in its most preferred embodiment, includes a scan

2   peripheral, i.e., a scanner or a multi-function scan peripheral, that provides a scan

3   driver a capability descriptor that the driver can use to dynamically configure

4   itself. However, a driver of the invention may also account for the case where a

5   scan peripheral is unable to provide a capability descriptor by determining a model

6   of the scan peripheral and selecting an appropriate predetermined capability

7   description for the scan peripheral. The invention is particularly beneficial to

8   dedicated servers, such as Hewlett-Packard JetDirect® servers, that operate with

9   many different types of peripherals. Such servers operate under constraints that

10   make it harder to deploy and install new software to address a peripheral model

11   unaccounted for by the software originally resident in the server. Artisans will

12   appreciate that the adaptive driver part of the invention may also be realized

13   outside of a dedicated server as software or in any general purpose computer

14   having a peripheral interface.

15   FIG. 1 illustrates the preferred case where a preferred server 10

16   connects a peripheral 12 to a network 13 accessible by one or more client

17   computers 14. The server 10 also provides an interface to one or more additional

18   peripherals 16a, 16b. The server 10 includes a driver 18. The driver 18 might

19   alternately be resident in another device, such as a computer or server directly

20   interfaced to one or more peripherals.

21   The peripheral 12 and peripherals 16a, 16b are preferably

22   constructed in accordance with the invention to provide a capability descriptor in

23   response to a query by the driver 18. A capability descriptor provides information

24   about the scan capabilities offered by the peripheral and is preferably realized as a

25   data string. The capability descriptor may include, for example, one or more of

1   dots per inch choices, paper sizes, color/grayscale options, image formats, and
2   whether or not a preview scan is supported.

3   Referring now to FIG. 2a, the manner in which the preferred driver
4   18 of the invention conducts a scan job is shown. A scan job is initiated 20 upon a
5   request from a client computer. Memory is checked 22 to see if a capability
6   descriptor has been previously stored for the scan peripheral to which the scan job
7   is directed. If there is no previously stored capability descriptor, a query is made
8   to obtain 24 a capability descriptor from the peripheral to which the scan job is
9   directed. It is then determined 26 whether an appropriate capability descriptor has
10   been received. A received capability descriptor is stored 28 in memory for future
11   use with scan jobs associated with the peripheral from which it was received. If
12   there is no received or previously stored capability descriptor, the response to the
13   query from the scan peripheral is checked 30 for model information. This will be
14   the case where the scan peripheral has not been made to provide capability
15   descriptors. Model information is typically provided by conventional scan
16   peripherals on request. If necessary, a separate request for the model information
17   is conducted. Using the model information, memory is referenced 32 to select a
18   pre-stored capability descriptor that matches the model information.

19   Information contained in the capability descriptor provides the basis
20   for identifying the exact nature of scanning supported by a scan peripheral with
21   which the capability descriptor is associated. The preferred example in FIGs. 2a
22   and 2b provides a standard set of capability options, though others are possible.
23   The capabilities of the scan peripheral obviously affect the type of scan which can
24   be selected, so the driver operation in FIG. 2a first examines the capabilities to
25   alter a user interface provided on a client machine which initiated the request for a
26   scan job.

27   In the preferred embodiment of FIG. 2a, a capability descriptor is
28   examined for whether its associated scan peripheral supports color scanning 34,
29   for the associated scan peripheral's maximum scan size 36, for whether the

5

1   associated peripheral supports a flatbed scan 38, and for whether the associated

2   peripheral supports the JPEG image format 39. For purposes of illustrating the

3   invention, typical dynamic options are shown. Other choices, such as PDF and

4   TIFF formats, are assumed to be always available in the driver. The list of options

5   to be enabled may be altered as a matter of design choice, as will be recognized by

6   artisans. For each dynamic option in FIG. 2a, a positive indication results in the

7   option being enabled. Thus, in FIG. 2a, options may be enabled for a color scan

8   40, for a legal size scan 42, for a photo size scan 44, and for a JPEG format 46.

9   Each enabled option is submitted 47 to the client. This allows

10 activation of appropriate options within a scan interface in the client machine.

11 Once a user selects parameters for a scan from among the enabled options and any

12 other standard parameters, scan driver initialization commences 48 as shown in

13 FIG. 2b. Returned parameters allow the driver 18 to configure itself based upon

14 those selected parameters and the scan peripheral's capabilities. As in FIG. 2a,

15 only typical dynamic options based on the capability descriptor are illustrated, i.e.,

16 a typical set of options that might vary from one model of scan peripheral to

17 another. There are many more possible parameter choices that do not depend on

18 the descriptor, i.e., parameter choices commonly shared by most, if not all, scan

19 peripherals. The latter type of parameter choice is not illustrated in FIG. 2b in

20 order to keep the illustration simple.

21 In FIG. 2b, the driver 18 checks the control language 50 and then

22 configures itself according to the control language, for example, as a first language

23 configuration 52 or as a second language configuration 54. Scanning control

24 languages may be manufacturer specific languages or industry shared languages.

25 Support for ADF (automatic document feed) is checked 58 and a corresponding

26 ADF scan 62 configuration is made. An image format parameter is checked 64

27 and the appropriate image format is configured, for example, as a TIFF format 64,

28 a JPEG format 68 or a PDF format 70. Using the configured driver modules, the

29 scan is then executed 72.

1   The modules allowing the driver 18 to configure itself are separate

2   driver modules which become linked for a scan job according to selected

3   parameters and capabilities. Driver modules must be organized to permit such

4   linking. A preferred organization for driver modules is shown in FIG. 3. As in

5   FIGs. 2a and 2b, only an exemplary set of dynamic modules are accounted for in

6   FIG. 3, while others are likely to be used in practice. Driver modules on the same

7   row are alternates. This permits linking through only one module from each row

8   since the modules in each row are mutually exclusive choices. The organization in

9   FIG. 3 is logical, of course, and any suitable software/firmware architecture may

10   be employed to realize the logical organization and linking operation of the driver

11   modules.

12   Referring to FIG. 3, which is based upon the available options in

13   FIG. 2b, first language and second language modules 74, 76 form alternate

14   options, and the image format modules, TIFF module 80, JPEG module 82 and

15   PDF module 84 form alternate options. Scan data is routed through the enabled

16   modules for the duration of a scan job executed by step 72 in FIG. 2b. The next

17   job might request a different format and might be routed to a peripheral having

18   different capabilities, so the data will likely be routed through different modules.

19   A scan interface module 86 interfaces the driver 18 to the rest of the

20   system. The definition of the remaining system will vary according to where the

21   driver is resident. In the case of the driver being in a network connected

22   peripheral server, such as a JetDirect®, it includes a network code to transfer data

23   to a destination client PC. In the case of a directly connected device, it is the

24   interface to the software that requested the scan job. That software might display

25   the image to the user, might insert it into a word processor document, might attach

26   it to an e-mail message, might automatically archive it in permanent storage, etc.

27   A device interface module 88 communicates with a scan peripheral 12. In the case

28   where the driver is resident in a server, such as a JetDirect®, the device interface

1   88 may interface to multiple scan peripherals, or a scan peripheral and other types

2   of peripherals, or any combination of common and different type peripherals.

3   Artisans will appreciate the flexibility provided by the invention. A

4   driver of the invention dynamically handles scan peripherals having different

5   capabilities without the need for update of the driver, a feature which is especially

6   useful in a peripheral server.

7   While various embodiments of the present invention have been

8   shown and described, it should be understood that other modifications,

9   substitutions and alternatives are apparent to one of ordinary skill in the art. Such

10   modifications, substitutions and alternatives can be made without departing from

11   the spirit and scope of the invention, which should be determined from the

12   appended claims.

13   Various features of the invention are set forth in the appended

14   claims.

1   1.   A program for interfacing a client computer to one or more

2 scan peripheral devices, the program comprising functions for:

3   querying a scan peripheral for a capability descriptor;

4   determining whether an appropriate capability descriptor is obtained

5 in response to said step of querying;

6   storing a capability descriptor associated with a scan peripheral for

7 which an appropriate information capability descriptor has been received as

8 determined in said step of determining;

9   configuring a scan driver for a scan job for a scan peripheral when a

10 scan job is requested by a client by linking a set of pre-stored driving modules, a

11 set of pre-stored driving modules being selected according to user set parameters

12 in the scan job and capabilities indicated in a stored information capability

13 descriptor concerning a scan peripheral to which the scan job is directed.

1   2. The program according to claim 1, further comprising a step of

2 de-linking pre-stored driving modules upon completion of a scan job.

1   3.   The program according to claim 1, wherein said step of

2 configuring includes extracting information from a stored capability descriptor to

3 alter a user interface dependent upon a peripheral's capabilities.

1   4.   The program according to claim 1, wherein a capability

2 descriptor stored in said step of storing comprises a string including fields

3 indicating dots per inch capabilities, paper size capabilities, color/grayscale

4 options, image formats supported, and whether or not a preview scan is supported.

1   5.   The program according to claim 1, stored in a server which

2 provides an interface to a network and at least one scan peripheral.

1   6.   The program according to claim 1, stored in a computer

2 connected to at least one scan peripheral.

1   7. The program according to claim 1, further comprising a functions

2 for:

9

3   obtaining a model of scan peripheral for a peripheral when said
4   function for determining determines that an appropriate capability descriptor was
5   not received in response to a query conducted by said function for querying; and

6   associating a pre-stored capability descriptor with a scan peripheral
7   whose model was determined by said step of obtaining.

1   8. A scan peripheral server having a network connection interface
2   and one or more ports for connection to at least one scan peripheral, the server
3   including:

4   memory for storing capability descriptors defining capabilities of
5   scan peripherals;

6   memory for storing a set of driver modules; and

7   a program for controlling execution of scan jobs requested from the
8   network connection of a scan peripheral connected to one of said one or more
9   ports, the program comprising functions for

10   obtaining a capability descriptor from one or more scan
11   peripherals connected to any of said one or more ports;

12   storing a received capability descriptor in said memory for
13   storing capability descriptors;

14   accepting a scan job request from said network connection for
15   one or more scan peripherals attached to said one or more ports;

16   extracting capability information from a stored capability
17   descriptor in response to a scan job;

18   sending information to said network connection to modify a
19   user interface;

20   accepting parameters for a scan job from said network
21   connection;

22   linking driver modules from said set of driver modules
23   according to capability information extracted by said function for extracting and
24   parameters accepted by said function for accepting; and

25   controlling a scan job according to the driver modules linked

26   in said function for linking.

1   9.   The server according to claim 8, wherein a capability

2   descriptor comprises a data string of capability data.

1   10.   The server according to claim 8, wherein said program for

2   controlling execution of scan jobs further comprises:

3   obtaining model information from any one or more scan peripherals

4   connected to any of said one or more ports when said any one or more scan

5   peripherals does not provide a capability descriptor; and

6   associating a capability descriptor pre-stored in said memory for

7   storing capability descriptors with said any one or more scan peripherals which

8   does not provide a capability descriptor according to model information obtained

9   in said step of obtaining.

1   11. The server according to claim 8, wherein a data string is

2   formatted as a data string including a scan language, an image format, a resolution

3   and a preview scan capability.

1   12.   A peripheral including a scanning capability, the peripheral

2   comprising:

3   a scan system for scanning documents and producing electronic data

4   therefrom;

5   an interface for connecting to a client machine or server;

6   memory for storing data;

7   a scan capability descriptor stored in said memory; and

8   a controller for communicating with said client machine or server

9   through said interface to perform a scan job, said controller sending said capability

10   descriptor to said client machine or server through said interface in response to a

11   query requesting a capability descriptor.

1   13.   A method for controlling a scan job directed to a peripheral

2   including a scanning function, the method comprising steps of:

3   obtaining a capability descriptor from the peripheral including the

4   scanning function; then, to implement a scan job,

5   configuring a scan driver from a set of scan drive modules based

6   upon capabilities indicated by said capability descriptor and parameters included

7   in the scan job.

ABSTRACT

1   A driver of the invention adapts to scan peripherals using

2 information in capability descriptor provided by scan peripherals or a capability

3 descriptor selected based upon scan peripheral model information. A driver of the

4 invention automatically determines a scan peripheral's capabilities using

5 information from the capability descriptor, and uses the information to configure

6 itself from a set of driver modules. A user interface and scan job are then run

7 through options enabled by the appropriate set of driver modules as determined by

8 the capability descriptor. A preferred embodiment server of the invention

9 embodies such an adaptive driver that queries a scan peripheral when it is first

10 connected to the server. If an appropriate capability descriptor is obtained in

11 response to the query, the capability descriptor is stored for use during a scan job.

12 When a scan job using that peripheral is requested, user interface code extracts

13 information from the capability descriptor to allow the user interface to

14 dynamically change dependent upon the peripheral's capabilities as indicated by

15 the information from the capability descriptor. Capabilities indicated by a

16 capability descriptor might include, for example, dots per inch choices, paper

17 sizes, color/grayscale options, image formats, and whether or not a preview scan is

18 supported. The appropriate capabilities become selectable through a user interface

19 at a client computer. When a scan job is directed, scan driver software/firmware

20 uses selected parameters passed by the client and the information from the stored

21 capability descriptor to determine an appropriate command protocol and image

22 encoding. A set of driver modules is then dynamically linked to create an
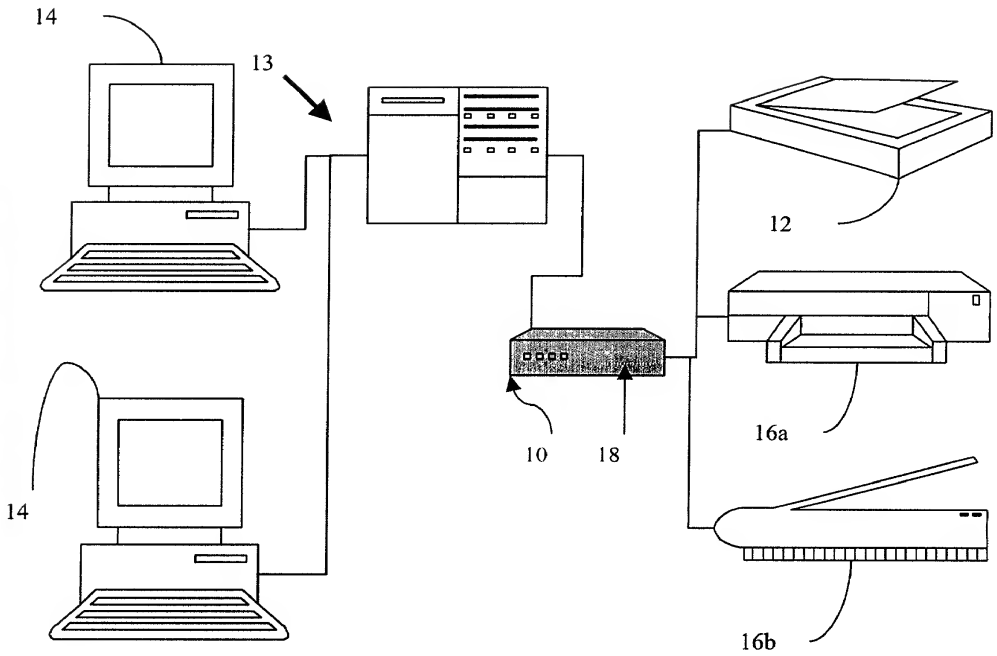
23 appropriate driver for the scan job.
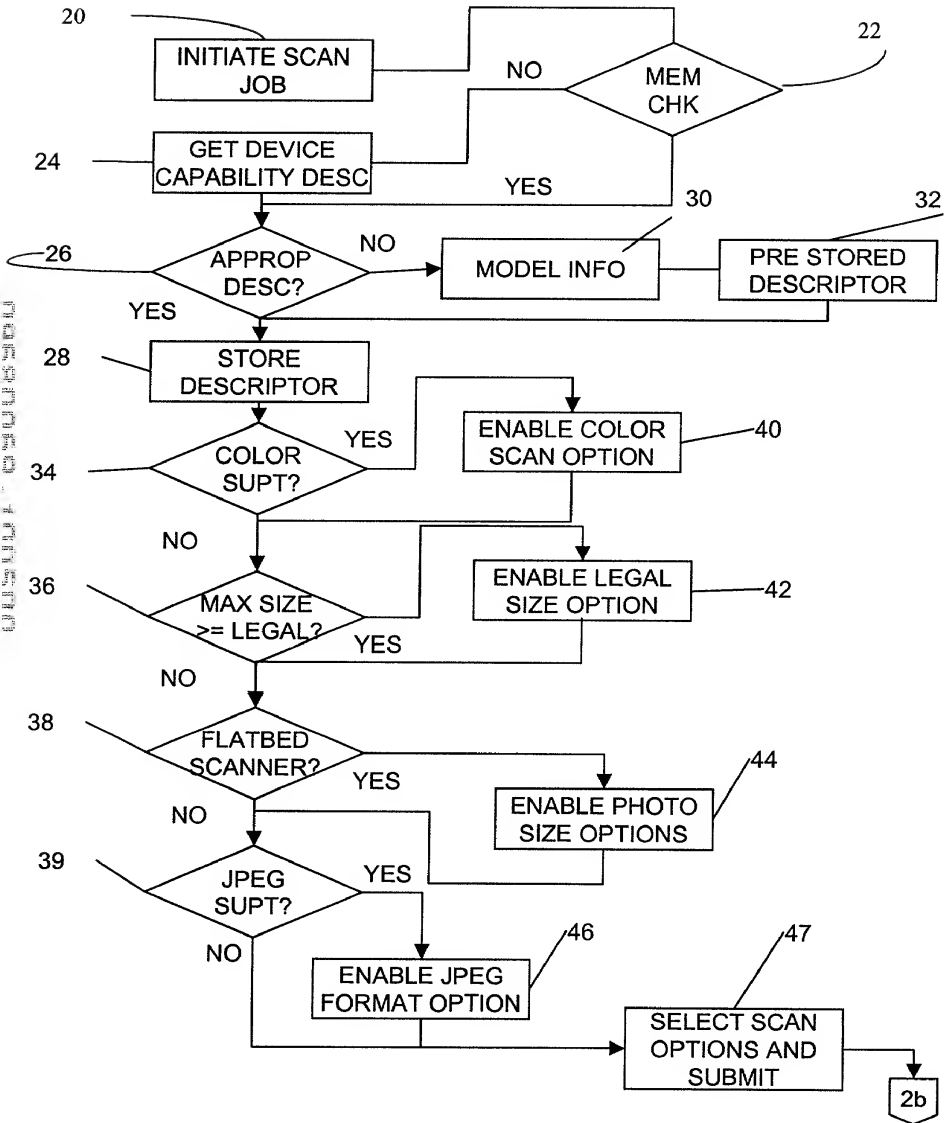
FIG. 1

FIG. 2a

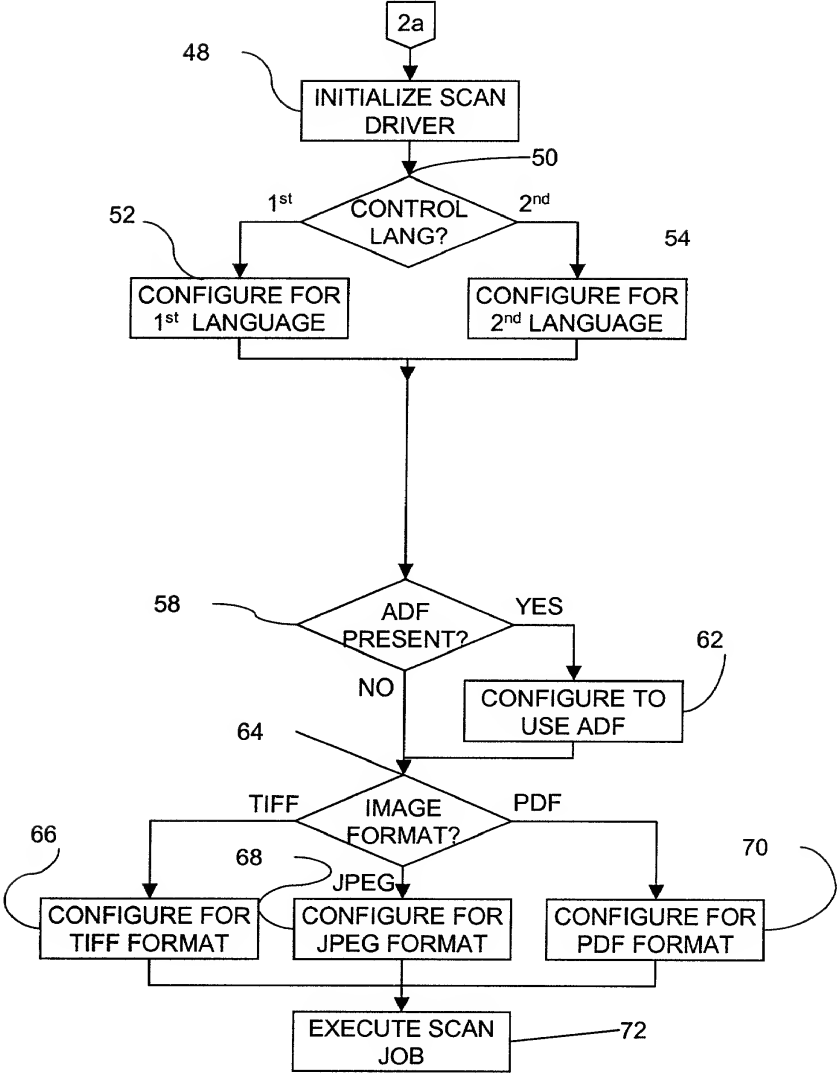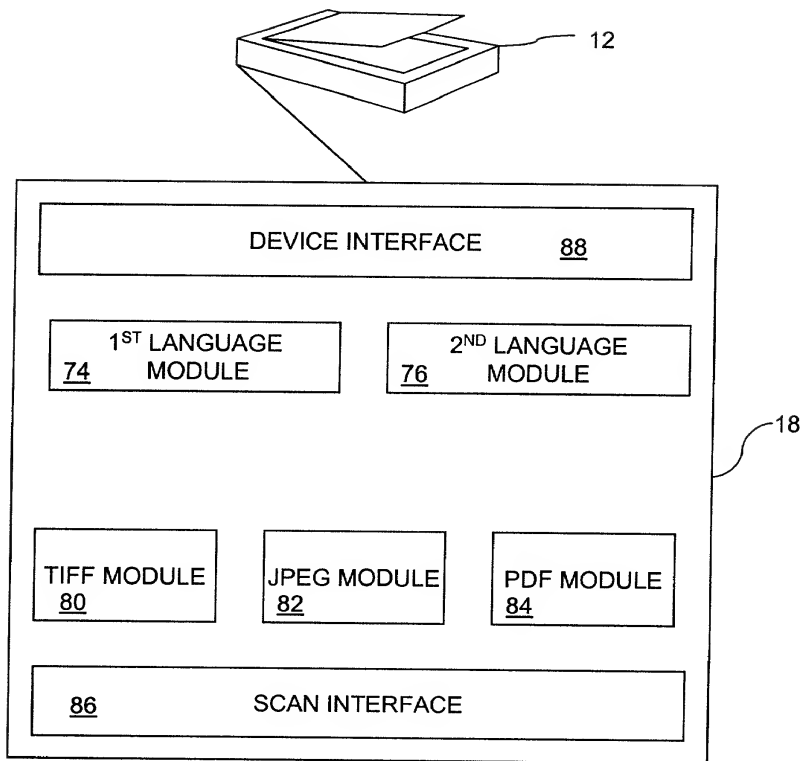# FIG. 2b

FIG. 3

DEVICE INTERFACE <u>88</u>

1ST LANGUAGE	2ND LANGUAGE
<u>74</u> MODULE	<u>76</u> MODULE

TIFF MODULE	JPEG MODULE	PDF MODULE
<u>80</u>	<u>82</u>	<u>84</u>

<u>86</u> SCAN INTERFACE

12

18

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION	ATTORNEY DOCKET NO. <u>10006131-1</u>

As a below named inventor, I hereby declare that:

My residence/post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

ADAPTIVE SCAN DRIVER AND SCAN PERIPHERAL

the specification of which is attached hereto unless the following box is checked:

( ) was filed on _____ as US Application Serial No. or PCT International Application Number _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understood the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above. I acknowledge the duty to disclose all information which is material to patentability as defined in 37 CFR 1.56.

Foreign Application(s) and/or Claim of Foreign Priority

I hereby claim foreign priority benefits under Title 35, United States Code Section 119 of any foreign application(s) for patent or inventor(s) certificate listed below and have also identified below any foreign application for patent or inventor(s) certificate having a filing date before that of the application on which priority is claimed:

COUNTRY	APPLICATION NUMBER	DATE FILED	PRIORITY CLAIMED UNDER 35 U.S.C. 119	
			YES: ___	NO: ___
			YES: ___	NO: ___

Provisional Application

I hereby claim the benefit under Title 35, United States Code Section 119(e) of any United States provisional application(s) listed below:

APPLICATION SERIAL NUMBER	FILING DATE

U. S. Priority Claim

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION SERIAL NUMBER	FILING DATE	STATUS (patented/pending/abandoned)

POWER OF ATTORNEY:

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

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Send Correspondence to: **HEWLETT-PACKARD COMPANY** **Intellectual Property Administration** **P.O. Box 272400** **Fort Collins, Colorado 80527-2400**	**Direct Telephone Calls To:** **David M. Mason** **(408) 447-0854**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of Inventor: <u>**Daniel R. Pearson**</u>   Citizenship: _____

Residence: _____

Post Office Address: <u>n/a</u> _____

Inventor's Signature _____   Date _____

Full Name of # 2 joint inventor: David A. Kumpf   Citizenship: _____

Residence: _____

Post Office Address: _____

Inventor's Signature _____   Date _____

Full Name of # 3 joint inventor: Glenn G. Carcido   Citizenship: _____

Residence: _____

Post Office Address: _____

Inventor's Signature _____   Date _____

Full Name of # 4 joint inventor: _____   Citizenship: _____

Residence: _____

Post Office Address: _____

Inventor's Signature _____   Date _____

Full Name of # 5 joint inventor: _____   Citizenship: _____

Residence: _____

Post Office Address: _____

Inventor's Signature _____   Date _____

Full Name of # 6 joint inventor: _____   Citizenship: _____

Residence: _____

Post Office Address: _____

Inventor's Signature _____   Date _____

Full Name of # 7 joint inventor: _____   Citizenship: _____

Residence: _____

Post Office Address: _____

Inventor's Signature _____   Date _____

Full Name of # 8 joint inventor: _____   Citizenship: _____

Residence: _____

Post Office Address: _____

Inventor's Signature _____   Date _____